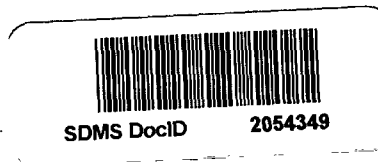




Infrastructure, environment, buildings

Toni Hemerka
Borough of Bally
425 Chestnut Street
Bally, PA 19053



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Subject:
Preliminary Aquifer Test, [REDACTED] Property

ENVIRONMENT

Dear Ms. Hemerka:

As you are aware, in June 2005 an exploratory pilot borehole was installed and tested for water yield and quality at the Longacre property north of Bally Borough. This document summarizes the initial data collection and evaluation conducted to date for this borehole.

Date:
22 August 2005

Contact:
Christopher Sharpe

Phone:
(267) 685-1800

Email:
csharpe@arcadis-us.com

Our ref:
NP000596.0002.00016

1. Pilot Borehole and Piezometer Installation

On June 20, 2005, drilling was initiated at the [REDACTED] property at the location shown on Figure 1. The pilot borehole was advanced to approximately 145 feet below land surface (BLS) before encountering competent dolostone bedrock of the Leithsville Formation. Nominal six-inch diameter steel casing was set to a depth of 160 feet BLS. Drilling continued to a depth of 385 feet BLS, at which point the well was producing water at an estimated 300 gallons per minute (gpm) via air lifting by the drill rig. This flow rate estimate was based on visual observations by the driller and ARCADIS' field geologist. The majority of this water was produced from a fracture/void interval between 345 and 385 feet below ground surface (bgs).

Additionally, three piezometers, PZ-1, PZ-2 and PZ-3, were installed at the site to assess whether pumping of the borehole affected nearby surface water bodies. The locations of the piezometers are shown on Figure 1. PZ-1 was screened across surface water and situated adjacent to PZ-2, which was screened across the water table and sealed from the surface water using bentonite. PZ-3 was installed in the wetlands hydraulically down gradient of the test well and screened across the water table.

2. Aquifer Testing

Following installation of the pilot borehole, it was developed, disinfected and temporarily fitted with a submersible pump for testing purposes. The testing was

Part of a bigger picture

AR300334

performed to: 1) evaluate the suitability of this portion of the property for location of a high yield community well, and 2) preliminarily determine the potability of the groundwater relative to drinking water quality criteria. Results of the testing indicate that moving forward with a production well at this location is feasible.

2.1 Test Performance

The pumping test was run for approximately 48-hours at a constant flow rate of 160 gpm, beginning on June 27, 2005 and ending on June 29, 2005. The flow rate was limited by the pump size that could be placed in the 6-inch borehole. Prior to starting the test the water level in the pilot borehole was approximately 30 feet below ground surface. Once the test was started, the pilot well water level steadily declined until it stabilized approximately 45 hours into pumping. Total drawdown at the end of the test was approximately 33 feet, resulting in a 48-hour specific capacity of 4.8 gpm/ft drawdown. The water level in the pumping well exhibited 90 percent recovery back to the pre-test level within five minutes of pump shutdown.

ARCADIS monitored precipitation during the test via an on site rain gauge. On the evening of June 28, 2005, approximately 0.38 inches of rain fell at the test site over the span of several hours.

At the end of the test, just prior to pump shut off, ARCADIS collected a groundwater sample for New Source parameter analysis. Additionally, a Microscopic Particulate Analysis (MPA) sample was collected following the New Source sample. Samples were collected directly from the discharge line at the well head, via an inline sample port.

2.2 Water Level Response

In addition to the pilot well, water levels were monitored before, during and after the pumping test at the following locations: piezometers PZ-1, PZ-2 and PZ-3; two on-site spring-boxes, SP-1 and SP-2; a concrete cistern and a nearby residential well identified as RW-1 at the Edna [REDACTED] property. The locations of the monitored points are shown on Figure 1. In short, monitored water levels did not suggest any influence from the pumping test, demonstrating the deep protected nature of the water bearing zone. Provided below is a brief summary of water level response at the various monitoring locations.

The piezometers were monitored regularly throughout the test. Two of these, PZ-1 and PZ-2, showed an increase in water levels during the test. PZ-2 exhibited a slow steady rise over the course of the test while PZ-1 exhibited a sudden rapid increase in

water level approximately 4 hours after the start of the test. The third (PZ-3) did not exhibit a discernable trend during the test.

The water level in the spring box SP-1 remained generally slightly below ground surface throughout the test. The water level in SP-1 was approximately at ground surface before the test, decreased by less than a tenth of a foot for a portion of the test, then increased again towards the end of the test to the baseline level. Following the test, the water level in SP-1 again decreased by less than one tenth of a foot and rebounded to static level within 20 hours. SP-2 was dry before the test and remained so throughout the entire test. The very slight variation in water levels was felt to be a function of the rainfall, with no discernable correlation to pumping at the pilot well.

A slight water level decrease was observed in the cistern, but the change in water level was within the range of climatic changes (rainfall and barometric pressure) during the test.

Lastly, as would be expected for a residential well, the water levels in the Edna [REDACTED] well were somewhat erratic due to use of the well during the test. Well water levels fluctuated up and down with well use with the well recovering back to static conditions in between use. Full recovery of the well between use suggested no influence from the pilot well test.

3. Laboratory Analytical Results

Water quality samples were submitted to a Pennsylvania Department of Environmental Protection (PADEP)-certified laboratory. Table 1 presents the analytical results as well as the PADEP's Community Water Supply Maximum Contaminant Levels (MCL) as required by the Community New Water Supply Source Requirements for groundwater sources. No regulated compounds were detected above respective MCLs. Total coliform was detected in the first of the three required samples, but not in the following two. The source of the coliform is believed to be a result of sample container or sample port contamination.

4. Summary

Results of the preliminary pumping test indicate the location is suitable for a potable, high yield community supply well. The specific capacity of the pilot borehole relative to the depth of the major water producing zone and resultant available drawdown indicate a larger diameter well on the order of 8-inches could sustain a yield at the target design rate of 300 to 400 gpm. For instance, the estimated total drawdown at 350 gpm would be approximately 73 feet, which is equivalent to a depth from ground surface of 100 feet, considerably less than the depth of the water

ARCADIS

Toni Hemerka
22 August 2005

bearing zone at 360 feet bgs. Results of the test indicate that the next phase of the project, installation and testing of a final production well at this location can proceed as planned.

As we have discussed, ARCADIS is in the process of preparing for installation of a permanent water supply well on the Longacre property. Installation of additional water level monitoring wells will begin next week, and aquifer testing of the permanent water supply well is anticipated during early October 2005. If you have any questions regarding this information presented in this letter or the upcoming drilling and testing activities, please do not hesitate to call us

Sincerely,

ARCADIS G&M, Inc.



Christopher T. Sharpe
Staff Geologist



Michael F. Bedard, P.E.
Project Manager

Copies:

C.A. Gahagan
L. Borland
E. Schmidley

AR300337

**Table 1. Analytical Results for Groundwater Samples
Collected from Test Well A, June 2005**

Bally, Pennsylvania

Parameter	MCL¹		Result²	Unit³
<u>PRIMARY CONTAMINANTS</u>				
Volatile Organic Chemicals (VOCs)				
Benzene	0.005	<	0.0005	
Carbon Tetrachloride	0.005	<	0.0005	
o-Dichlorobenzene	0.6	<	0.0005	
para-Dichlorobenzene	0.075	<	0.0005	
1,2-Dichloroethane	0.005	<	0.0005	
1,1-Dichloroethylene	0.007	<	0.0005	
cis-1,2-Dichloroethylene	0.07	<	0.0005	
trans-1,2-Dichloroethylene	0.1	<	0.0005	
Dichloromethane	0.005	<	0.0005	
1,2-Dichloropropane	0.005	<	0.0005	
Ethylbenzene	0.7	<	0.0005	
Monochlorobenzene	0.1	<	0.0005	
Styrene	0.1	<	0.0005	
Tetrachloroethylene	0.005	<	0.0005	
Toluene	1	<	0.0005	
1,2,4-Trichlorobenzene	0.07	<	0.0005	
1,1,1-Trichloroethane	0.2	<	0.0005	
1,1,2-Trichloroethane	0.005	<	0.0005	
Trichloroethylene	0.005	<	0.0005	
Vinyl Chloride	0.002	<	0.0005	
Xylenes (Total)	10	<	0.0005	
Synthetic Organic Chemicals (SOCs)				
Alachlor	0.002	<	0.0001	
Atrazine	0.003	<	0.001	
Benzo(a)Pyrene	0.0002	<	0.0001	
Carbofuran	0.04	<	0.002	
Chlordane	0.002	<	0.001	
2,4-D	0.07	<	0.0005	
Dibromochloropropane (DBCP)	0.0002	<	0.00001	
Di(2-Ethylhexyl) Adipate	0.4	<	0.0006	
Di(2-Ethylhexyl) Phthalate	0.006	<	0.0006	
Endothall	0.1	<	0.009	
Ethylene Dibromide (EDB)	0.00005	<	0.00001	
Hexachlorocyclopentadiene	0.05	<	0.00005	
Lindane	0.0002	<	0.00005	
Methoxychlor	0.04	<	0.0005	

**Table 1. Analytical Results for Groundwater Samples
Collected from Test Well A, June 2005**

Bally, Pennsylvania

Parameter	MCL ¹	Result ²	Unit ³
Oxamyl (Vydate)	0.2	< 0.002	
PCBs	0.0005	N/A ⁴	
Pentachlorophenol	0.001	< 0.0003	
Picloram	0.5	< 0.0003	
Simazine	0.004	< 0.0003	
2,3,7,8-TCDD (Dioxin)	3 x 10 ⁻⁸	N/A ⁵	
Radionuclides			
Gross Alpha	15 ⁶	1.37	pCi/L
Combined Radium (226 +228)	5	2.54	pCi/L
Beta Particle & Photon Activity	50 ⁷	1.54 ⁷	pCi/L
Uranium	30	0.60	µg/L
Inorganic Chemicals (IOCs)			
Antimony	0.006	< 0.0006	
Arsenic	0.05 ⁸	< 0.0006	
Asbestos (Fibers longer than 10µm)	7	N/A ⁹	million fibers/L
Barium	2	0.0135	
Beryllium	0.004	< 0.0005	
Cadmium	0.005	< 0.0006	
Chromium	0.1	< 0.004	
Copper	1.0 ¹⁰	0.031	
Cyanide (free CN)	0.2	< 0.003	
Fluoride	2	0.3	
Lead	0.005 ¹⁰	0.0019	
Mercury	0.002	< 0.0002	
Nickel	NA ¹¹	< 0.002	
Nitrate (as Nitrogen)	10	1.7	
Nitrite (as Nitrogen)	1	< 0.001	
Selenium	0.05	< 0.003	
Thallium	0.002	< 0.0006	
Microbiological Contaminants			
Diatoms	NA	0 ¹²	number observed
Algae	NA	0 ¹²	number observed
Insect Parts/Crustacea	NA	0 ¹²	number observed
Rotifers	NA	0 ¹²	number observed
Plant Debris	NA	0 ¹²	number observed
Coccidian Oocysts	NA	0 ¹²	number observed
Giardia	NA	0 ¹²	number observed

**Table 1. Analytical Results for Groundwater Samples
Collected from Test Well A, June 2005**

Bally, Pennsylvania

Parameter	MCL ¹	Result ²	Unit ³
Sample 1: collected at 9:45			
Total Coliform	NA	21 ¹³	number observed
E. Coli	NA	0 ¹³	number observed
Sample 2: collected at 10:05			
Total Coliform	NA	0 ¹³	number observed
E. Coli	NA	0 ¹³	number observed
Sample 3: collected at 10:25			
Total Coliform	NA	0 ¹³	number observed
E. Coli	NA	0 ¹³	number observed
Other			
1,4-Dioxane	3.0 ¹⁴	< 3.0	µg/L
Turbidity	1	N/A ¹⁵	NTU

SECONDARY CONTAMINANTS

Alkalinity	NA ¹¹	92	
Aluminum	0.2	< 0.025	
Chloride	250	3.1	
Color	15	< 5 ¹⁶	color units
Foaming Agents	0.5	< 0.025	
Hardness	NA ¹¹	110	
Iron	0.3	0.196	
Manganese	0.05	0.007	
pH	6.5 - 8.5	7.47 ¹⁷	pH
Silver	0.1	< 0.0006	
Sulfate	250	11	
Temperature	NA ¹¹	N/A	
Total Dissolved Solids	500	180	
Zinc	5	0.0206	

**Table 1. Analytical Results for Groundwater Samples
Collected from Test Well A, June 2005**

Bally, Pennsylvania

Notes:

¹ MCL = Pennsylvania DEP Maximum Contaminant Levels for Community Groundwater Sources

² Bold if greater than MCL

³ All Units in mg/L unless otherwise noted:

µm = micrometers

pCi/L = picocuries per liter (particle activity)

µg/L = micrograms per liter

mrem/yr = millirems per year (annual dose equivalent)

⁴ Monitoring for PCBs is not required as there is no source of PCBs contamination within 1,000 feet of the new groundwater source

⁵ Monitoring for Dioxin is not required as there is no source of Dioxin contamination within 1,000 feet of the new groundwater source

⁶ Gross Alpha MCL excludes Radon and Uranium particle activity

⁷ Beta Particle & Photon Activity MCL is for man-made radionuclides. Results are reported for Gross Beta. Reported MCL of 4 mrem/yr is converted to an equivalent MCL of less than or equal to 50 pCi/L for Gross Beta per PA DEP guidance.

⁸ A new Arsenic MCL (0.010 mg/L) is effective January 23, 2006

⁹ Monitoring for Asbestos is not required as the source is not believed by the PA DEP to be vulnerable to asbestos contamination

¹⁰ The Copper and Lead primary MCLs are applicable only to bottled, vended, retail and bulk water hauling systems

¹¹ PA DEP has not published an MCL for this contaminant

¹² No significant amounts of the microbiological contaminant was found

¹³ Per 100 milliliters

¹⁴ No MCL exists for 1,4-dioxane; 3.0 µg/L is a potential standard for this compound for this site

¹⁵ Only applicable to unfiltered surface water sources

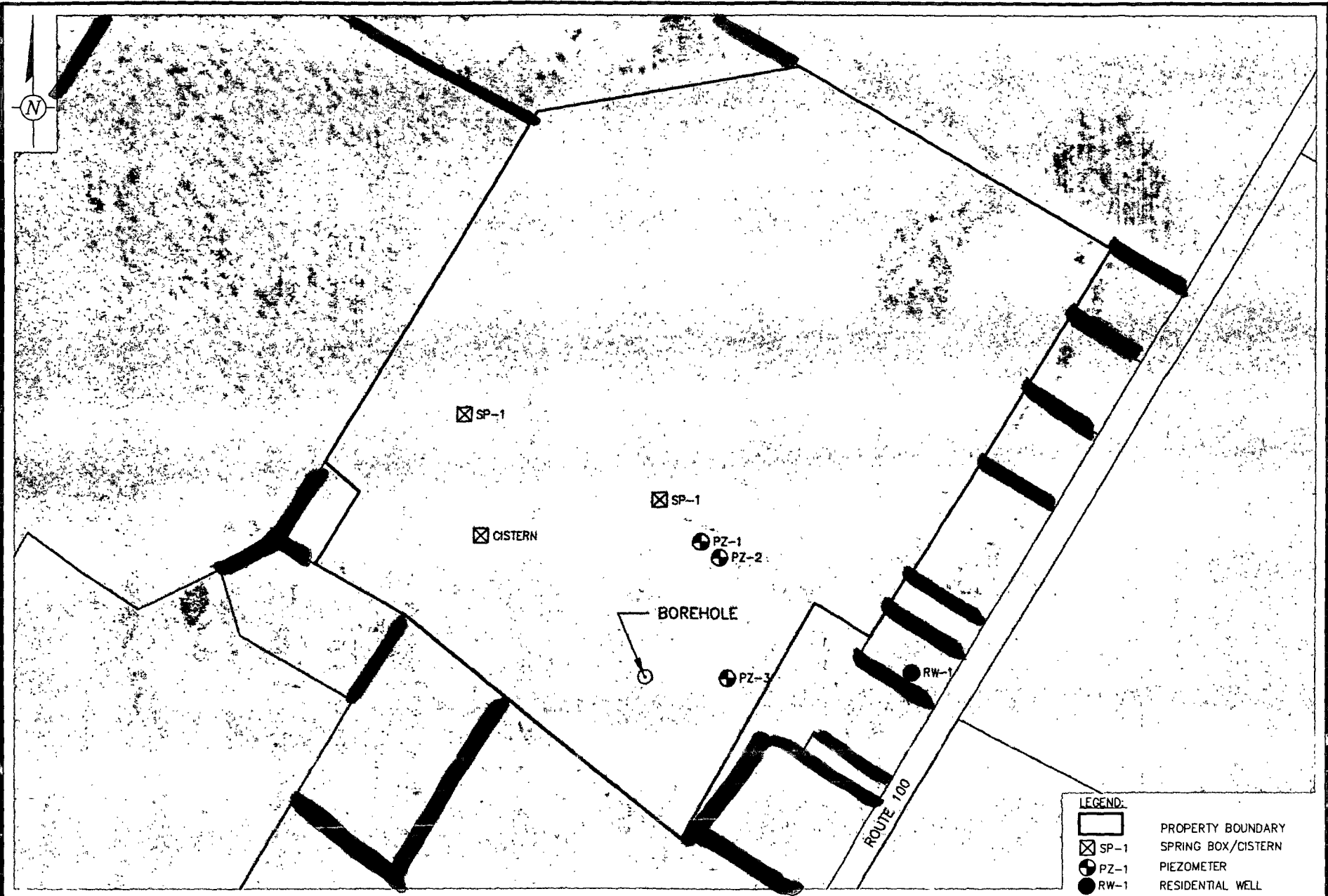
¹⁶ The pH of the sample was 7.84 at the time the color was measured. The PA DEP does not specify any pH parameters for color.

¹⁷ The pH was taken from a sample where the temperature was 17.6 °C

N/A = Not Analyzed

NA = Not Applicable

S:\PROJECT\AH Bally, PA\CADD\2005 Well Installation\48-Hr-Test_Summary letter\FIG-1 - SITE PLAN.dwg Aug. 17, 2005 LAYOUT: AERIAL



LEGEND:	
	PROPERTY BOUNDARY
	SP-1 SPRING BOX/CISTERN
	PZ-1 PIEZOMETER
	RW-1 RESIDENTIAL WELL

0 300
SCALE: 1"=300'

ARCADIS



AR300342

DRAWN M. WASILEWSKI	DATE 8/17/05	PROJECT MANAGER M. BEDARD	DEPARTMENT MANAGER A. ROBINSON
MONITORED LOCATIONS 48 HOUR AQUIFER PUMPING TEST, BALLY, PA JUNE 2005		LEAD DESIGN PROF. F. LENZO	CHECKED D. MCCARTHY
		PROJECT NUMBER NP000597.002	DRAWING NUMBER 1